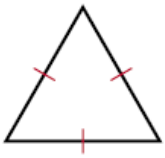
Attendance Problems.

1. Find each angle measure.



True or False. Explain your choice.

2. _____ Every equilateral triangle is isosceles.

3. _____ Every isosceles triangle is equilateral.

- I can prove theorems about isosceles and equilateral triangles.
- I can apply properties of isosceles and equilateral triangles.

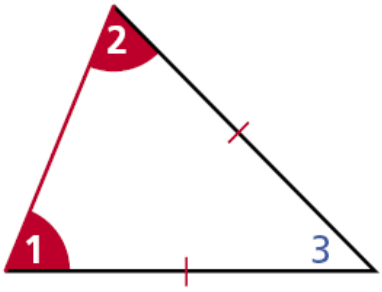
Vocabulary	
vertex angle	base
legs of an isosceles triangle	base angles

Common Core: CC.9-12.G.CO.10 Prove theorems about triangles.

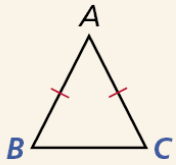
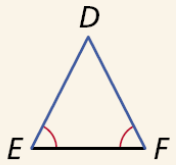
Recall that an isosceles triangle has at least two congruent sides. The congruent sides are called the **legs**. The **vertex angle** is the angle formed by the legs. The side opposite the vertex angle is called the **base**, and the **base angles** are the two angles that have the base as a side.

<3 is the vertex angle.

<1 and <2 are the base angles.



Theorems Isosceles Triangle

THEOREM	HYPOTHESIS	CONCLUSION
4-8-1 Isosceles Triangle Theorem If two sides of a triangle are congruent, then the angles opposite the sides are congruent.		$\angle B \cong \angle C$
4-8-2 Converse of Isosceles Triangle Theorem If two angles of a triangle are congruent, then the sides opposite those angles are congruent.		$\overline{DE} \cong \overline{DF}$

Reading Math

The Isosceles Triangle Theorem is sometimes stated as "Base angles of an isosceles triangle are congruent."

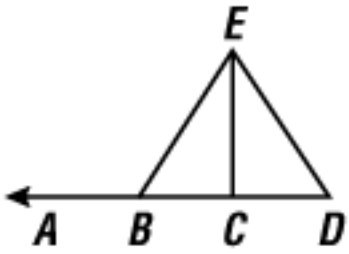
Video Example 1.

C is the midpoint of $\overline{BD}$.

Given: $m\measuredangle ABE = 105°$

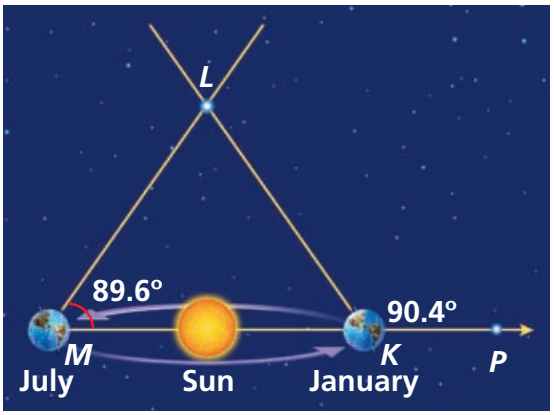
$m\measuredangle CDE = 75°$

Explain why BE = ED.



1 Astronomy Application

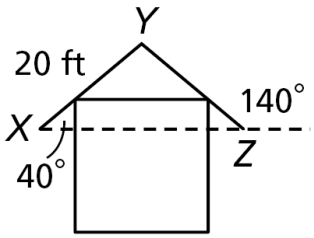
The distance from Earth to nearby stars can be measured using the parallax method, which requires observing the positions of a star 6 months apart. If the distance *LM* to a star in July is 4.0×10^{13} km, explain why the distance *LK* to the star in January is the same. (Assume the distance from Earth to the Sun does not change.)



Not drawn to scale

$m\angle LKM = 180 - 90.4$, so $m\angle LKM = 89.6°$. Since $\angle LKM \cong \angle M$, $\triangle LMK$ is isosceles by the Converse of the Isosceles Triangle Theorem. Thus $LK = LM = 4.0 \times 10^{13}$ km.

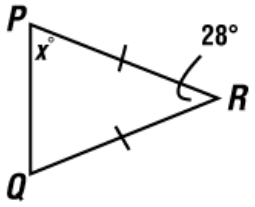
Example 1. The length of *YX* is 20 feet. Explain why the length of *YZ* is the same.



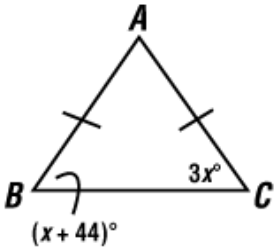
4. <u>Guided Practice</u>. If the distance from Earth to a star in September is 4.2×10^{13} km, what is the distance from Earth to the star in March? Explain your answer.

<u>Video Example 2</u>.

A. Find $m\measuredangle Q$.

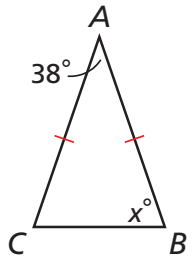


B. Find $m\measuredangle C$.



2 Finding the Measure of an Angle

Find each angle measure.



A $m\angle C$

$m\angle C = m\angle B = x°$ *Isosc. △ Thm.*

$m\angle C + m\angle B + m\angle A = 180$ *△ Sum Thm.*

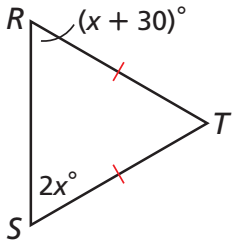
$x + x + 38 = 180$ *Substitute the given values.*

$2x = 142$ *Simplify and subtract 38 from both sides.*

$x = 71$ *Divide both sides by 2.*

Thus $m\angle C = 71°$.

B $m\angle S$



$m\angle S = m\angle R$ *Isosc. △ Thm.*

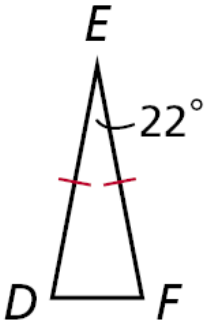
$2x° = (x + 30)°$ *Substitute the given values.*

$x = 30$ *Subtract x from both sides.*

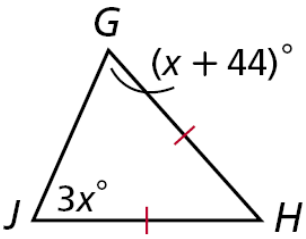
Thus $m\angle S = 2x° = 2(30) = 60°$.

Example 2.

A. Find $m\measuredangle F$.

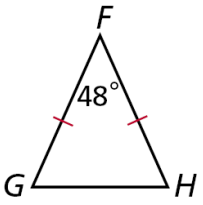


B. Find $m\measuredangle G$.

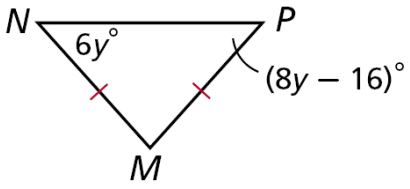


Guided Practice.

5. Find m<H.

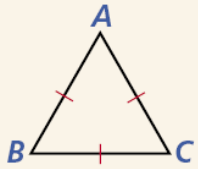


6. Find m<*N*.

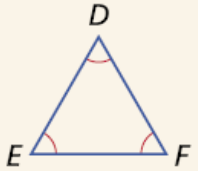


The following corollary and its converse show the connection between equilateral triangles and equiangular triangles.

Corollary 4-8-3 Equilateral Triangle

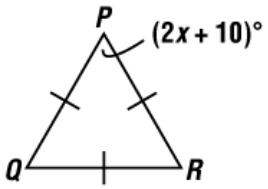
COROLLARY	HYPOTHESIS	CONCLUSION
If a triangle is equilateral, then it is equiangular. (equilateral △ → equiangular △)		$\angle A \cong \angle B \cong \angle C$

Corollary 4-8-4 Equiangular Triangle

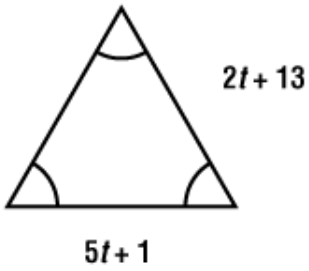
COROLLARY	HYPOTHESIS	CONCLUSION
If a triangle is equiangular, then it is equilateral. (equiangular △ → equilateral △)		$\overline{DE} \cong \overline{DF} \cong \overline{EF}$

Video Example 3.

A. Find the value of x.



B. Find the value of t.



3 Using Properties of Equilateral Triangles

Find each value.

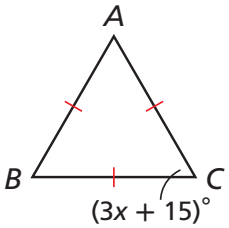
A x

$\triangle ABC$ is equiangular. — *Equilateral $\triangle \rightarrow$ equiangular $\triangle$*

$(3x + 15)^\circ = 60^\circ$ — *The measure of each $\angle$ of an equiangular $\triangle$ is 60°.*

$3x = 45$ — *Subtract 15 from both sides.*

$x = 15$ — *Divide both sides by 3.*



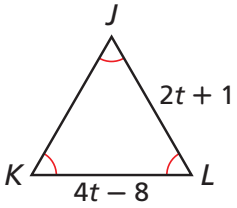
B t

$\triangle JKL$ is equilateral. — *Equiangular $\triangle \rightarrow$ equilateral $\triangle$*

$4t - 8 = 2t + 1$ — *Def. of equilateral $\triangle$*

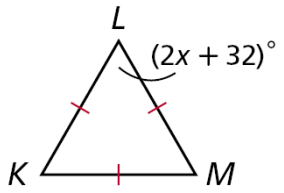
$2t = 9$ — *Subtract 2t and add 8 to both sides.*

$t = 4.5$ — *Divide both sides by 2.*

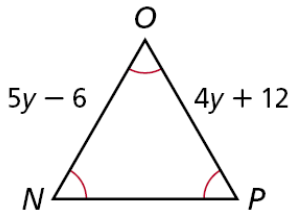


Example 3.

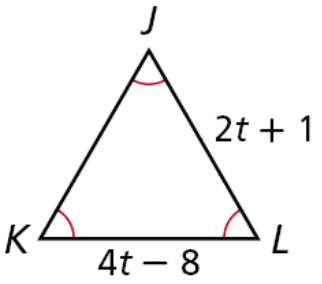
A. Find the value of x.



B. Find the value of y.



7. Guided Practice. Find the value of JL.



Remember!

A coordinate proof may be easier if you place one side of the triangle along the x-axis and locate a vertex at the origin or on the y-axis.

4-9 Isosceles & equilateral triangles

- *(p 289)* 12, 13-19 odd, 27, 28.
- 4B Ready to Go On pretest & posttests.